Science Council of British Columbia

Tenth Annual Report

1987-88

Secretariat on Science,
Research and Development

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June 30, 1988

The Honourable Stanley B. Hagen,
Minister of Advanced Education and Job Training,
Province of British Columbia,
Parliament Buildings,
Victoria, B.C.
V8V 1X4

Dear Mr. Hagen:

I have the honour to present you the Tenth Annual Report of the Science Council of British Columbia, and of the Secretariat on Science, Research and Development, for the year ending March 31, 1988.

Respectfully submitted,

James A. McEwen,
Chairman,
Science Council of British Columbia

Chairman

Dr.D.J.Connor

Executive Director

Dr.J.T.Sample

Dr.W.M.Armstrong

Mr.G.S.Balcom

Dr.T.W.Calvert

Mr.A.French

Ms.G.S.Gabel

Dr.D.V.George

Dr.T.E.Howard

Dr.P.A.Larkin

Dr.J.Levy

Dr.E.G.Manning

Mr.D.F.Miller

Dr.J.A.McEwen

Mr.J.R.McFarlane

Dr.K.R.Patel

Dr.G.W.Poling

Members of The Science Council of British Columbia

(List includes all those who served between April 1, 1987 and March 31, 1988)

Member	Date of First Appointment	Current Term Expires
Dr. Denis J. Connor Vice President, Corporate Development, MacDonald Dettwiler and Associates, Richmond	February 20, 1985 (Chairman from January 15, 1986 to March 31, 1988)	September 1, 1990
Dr. William M. Armstrong Retired, Vancouver	January 29, 1982	Honorary Member
Mr. Graeme S. Balcom President, Harmattan International Consulting, Vancouver	March 24, 1983	September 1, 1989
Dr. Tom W. Calvert, Vice President, Research and Information Systems, Simon Fraser University	January 7, 1988	September 1, 1988
Dr. D. Harold Copp Department of Physiology University of British Columbia	January 30, 1981	January 7, 1988
Dr. John M. Dewey Department of Physics, University of Victoria	February 13, 1985	January 7, 1988
Dr. John H. Dirks Head, Department of Medicine, University of British Columbia	December 5, 1985	June 30, 1987
Mr. Tony French President, Forintek Canada Corporation Vancouver	February 23, 1984	September 1, 1988

Members *cont....*

Member	Date of First Appointment	Current Term Expires
Ms. Gail S. Gabel Managing Director and C.E.O. Aanderaa Instruments Ltd., Victoria	January 7, 1988	September 1, 1988
Dr. Donald A. George Dean of Applied Sciences, Simon Fraser University	July 28, 1983	January 7, 1988
Dr. D. Val George President, Northwest College, Terrace	January 7, 1988	September 1, 1988
Mr. Bryon Hodges President, Windsor Machine Co. Ltd., Burnaby	June 13, 1984	May 31, 1987
Dr. Terry E. Howard President, British Columbia Research Corporation, Vancouver	July 26, 1984	September 1, 1989
Dr. Peter A. Larkin Vice President Research, University of British Columbia	March 14, 1985	September 1, 1989
Dr. Julia Levy Vice President, Research and Development, Quadra Logic Technologies, Vancouver	January 7, 1988	September 1, 1988
Dr. George A. May President, George A. May and Associates, Sooke	July 28, 1983	January 7, 1988
Dr. Eric G. Manning Dean of Engineering, University of Victoria	January 7, 1988	September 1, 1988

Members *cont....*

Member	Date of First Appointment	Current Term Expires
Dr. James A. McEwen Director, Biomedical Engineering, Vancouver General Hospital	September 18, 1986	September 18, 1988
Dr. James R. McFarlane President, International Submarine Engineering Ltd., Port Moody	January 7, 1988	September 1, 1988
Mr. Donovan F. Miller Corporate Director, Vancouver	December 14, 1983	September 1, 1988
Dr. Kamlesh R. Patel Research Director, AgriForest Technologies Ltd., Kelowna	January 7, 1988	September 1, 1988
Dr. George W. Poling Department of Mining and Mineral Process Engineering, University of British Columbia	February 23, 1984	September 1, 1989
Dr. Ian H. Warren Technical Consultant, Research and Development Department, Chemetics International, Richmond	June 13, 1984	January 7, 1988

Research Secretariat of British Columbia Staff

Dr. Jack Sample	Executive Director
Dr. Max Cairns	Associate Director
Miss Tracy Bowyer	Awards Secretary (Science Council)
Mr. Curt Brown	Awards Officer (T.E.S.T.)
Mrs. Mary Eickhoff	Secretary (B.C.H.C.R.F.)
Mrs. Pauline McKeever	Secretary (Science Council)
Mr. Doug McPherson	Accountant (Part-time Consultant) (to March 31, 1988)
Mr. David Rodger	Information Officer (Part-time Consultant)
Ms. Debra Seibold	Comptroller (from March 7, 1988)
Mr. Rick Warner	Awards Officer (Science Council)
Dr. Dick Whitney	Awards Officer (B.C.H.C.R.F.)
Miss Kelly Woudstra	Receptionist/Secretary (T.E.S.T.)

From the Chairman:

As incoming Chairman of the Science Council of British Columbia, I wish to recognize the remarkable accomplishments which have taken place during the past year under the Chairmanship of Dr. Denis Connor. Under his leadership, Science Council has played a major role in stimulating increased communication, cooperation and collaboration among the various sectors of the science and technology community in B.C., and in the development of achievable visions for the future. On behalf of Science Council, I wish to thank Dr. Connor for his superb job.

The Council has had an opportunity to renew and invigorate itself through the appointment of seven new members, through the addition of many individuals to its various sector committees, through the development of an exciting new statement of goals and objectives, and through strong support and encouragement from the Ministry of Advanced Education and Job Training.

I wish to thank the many individuals who have contributed so significantly to the past successes of Science Council. I look forward to the challenges of the coming year, particularly with respect to the process of identifying and exploiting new opportunities in the various sectors of the Province for the creative application of innovative science and technology leading to economic and social benefits. I am particularly pleased that these challenges will be met through the active participation of an increasing number of individuals from the science and technology community in British Columbia.

J. A. McEwen, Ph.D., P.Eng.
Chairman

The Year in Review

It was a year for planning and a year for action. If, in the past, there was a perception of the Science Council of British Columbia as an organization that normally responded to other people's initiatives rather than generating its own, that perception has been dispensed with forever. The Science Council served notice in 1987-88 that it intends to play a much more active role in gathering information and making recommendations based on that information.

With the assistance of John Witt of Western Management Consultants in Vancouver, the Science Council crafted both a new mission statement and a set of objectives. The Science Council's mission is to "identify and promote opportunities for the economic development of British Columbia by drawing on the science and technology community for creative applications of innovative science and technology."

A major objective arising from that mission involves the continued development of the Council's existing programs of assistance and support to companies, research institutes and universities and colleges. These include AGAR (Assistance Grants for Applied Research), GREAT (Graduate Research, Engineering and Technology) scholarships, IPDF's (Industrial Postdoctoral Fellowships) and the new STARS (Science and Technology Awards for Returning Students) scholarships. Details of these programs will be found elsewhere in this report.

SPARK: Strategic Planning for Applied Research and Knowledge

The SPARK process began in the spring of 1987, when the Science Council began looking for ways to bridge the gaps between the various sectors of the provincial economy. Although it wasn't yet called SPARK, the first manifestation of the new Science Council initiative was a highly successful conference on Advanced Forestry Technology, held in May. The conference was sponsored by the Federal Ministry of State for Science and Technology and chaired jointly by the Science Council and the Canadian Advanced Technology Association. There, representatives of the forest industry met with representatives of British Columbia's fast-growing electronics and "high tech" industries to explore opportunities for mutual benefit.

Eight sectors were identified for detailed study under the SPARK process. These were Agriculture and Food; Aquatic Resources; Biotechnology: Energy; Forests and Forest Products; Information Technology (combining Electronics and Communications and Computers and Computing); Manufacturing; and Mining, Minerals and Metals. Planning committees for each sector, based mainly on the Science Council's existing volunteer technical review committees, were struck. They met over the winter to discuss the strengths, weaknesses, threats to and opportunities within and across the sectors. They prepared draft reports outlining those factors and circulated them widely through their communities of interest. Then, SPARK forums were held to discuss and modify the reports.

As the fiscal year drew to a close, a series of three-hour open SPARK forums was underway at the B.C. Club in the British Columbia Enterprise Centre in Vancouver. When the SPARK reports are in their final form, plans are to forward them to the Ministry of Advanced Education and Job Training, which is responsible for science and technology in British Columbia. Next, the Ministry is expected to place them, together with their recommendations, before the Premier's Advisory Council on Science and Technology, which will review them before making recommendations to the Premier concerning future government science policy.

Supercomputer Study

Continuing in its proactive role, the Science Council undertook a review of the province's current and potential large-scale computing needs. The term "large-scale computing" is used to describe the portion of the computer industry which focuses on providing the most powerful systems possible to both scientific and technical users. A total of some 150 individuals, representing 60 organizations (universities, government agencies, research institutes and industrial firms) participated in the review. It was carried out by a special committee of the Science Council with the assistance of the DMR Group, a consulting firm with offices in Vancouver.

The study recommended that, for the time being at least, no major commitment of funds for a supercomputer centre, either private or government, is needed. It noted that while the demand for large-scale computing facilities in the province continues to grow each year, it simply isn't at a level that would justify the expenditure of the many millions of dollars such supercomputer installations require for capital and operating expenses.

AGAR: Assistance Grants for Applied Research

Two competitions in the AGAR program took place in 1987-88. They were the 16th and 17th competitions undertaken by the Science Council since 1979. On September 8th, Chairman Dr. Denis Connor announced the 29 research projects in Research Competition RC-16 that would be awarded a total of $1,345,478.

In March, he announced the RC-17 winners. This time, the number of projects approved for support jumped to 47, and the amount awarded, $2,071,492, exceeded $2 million for the first time since 1983.

With their grants, British Columbia scientists and engineers are helped to apply their research skills to take advantage of opportunities and solve problems leading to the development of new processes, systems and products.

GREAT: Graduate Research, Engineering and Technology Scholarships

British Columbia's future scientists and engineers are awarded scholarships in the Science Council's GREAT program. The students, from communities throughout the province, are in postgraduate studies at Simon Fraser University, the University of British Columbia and the University of Victoria.

GREAT scholarships are designed to encourage students working on master's degrees and doctorates in science and engineering, to carry out some of their thesis research in cooperation with an off-campus company, agency or research institute.

In an important modification of the GREAT rules, the Science Council now allows GREAT funds to be used to "top up" other scholarships the students may have secured. To put this into effect, the Council has increased the maximum value of the GREAT scholarships to $14,000, beginning with the 1988 awards. The Council will award $20,000, less the value of the other scholarships qualifying students hold, or $14,000 — whichever is lower.

Due to a change in scheduling, the last GREAT scholarships were awarded in the 1986-87 fiscal year and the next will be awarded in the beginning of the 1988-89 fiscal year. Accordingly, no GREAT awards were made in 1987-88.

IPDF: Industrial Postdoctoral Fellowships

The Science Council is eager to encourage the employment of more scientists in the province's private industrial sector. The Industrial Postdoctoral Fellowships, worth $25,000 a year each, are directed at companies and people who have recently received their Ph.D.'s in science or engineering. The money is to be used to help companies pay the salaries of qualified graduates.

In 1987-88, nine Industrial Postdoctoral Fellowships were awarded.

STARS: Science and Technology Awards for Returning Students

The STARS program, established this year, is designed for people in industry who want to return to university to improve their research skills. Consequently they will be awarded to men and women who have had a minimum of three years' experience in the workforce since their graduation. Like the IPDF's, which support the reverse process, they are worth $25,000 a year. Like the GREAT's, they

require those who receive them to carry out their thesis research in collaboration with an off-campus British Columbia company or industrial organization. There is no limit to the value of other scholarships an individual can hold.

The first two STARS were awarded in the spring of 1988.

British Columbia Science and Engineering Gold Medals

The Science Council established these awards to recognize the outstanding achievements of British Columbia's scientists and engineers.

The 1987 winners were:

In Industrial Innovation, **Derek Barnes**, **Mark Churchland** and **Walter Schilling** of MacMillan Bloedel Ltd.
They were responsible for the invention and commercial development of Parallam Parallel Strand Lumber, which has been acclaimed as one of the most significant contributions to new product development in the history of the forest industry.

In Natural Sciences, **Peter Hochachka**, a zoologist at the University of British Columbia.
Dr. Hochachka is recognized throughout the world for having discovered biochemical mechanisms used by animals to survive extreme environmental conditions.

For Technology Transfer, **Dr. Roy Nodwell**, Professor Emeritus of Physics at the University of British Columbia.
Dr. Nodwell helped create a climate in the UBC physics labs in which researchers learned to commercialize the results of their studies.

Special Awards and Grants

Major breakthroughs occurred around the world in the field of "high temperature" superconducting materials. For a while, the pace of discovery moved so rapidly that it ran ahead of the funds available to sustain it. In order to keep local scientists in the forefront of this research, the Science Council made $50,000 available. This special fund was used during the summer until crucial national support arrived.

The Science Council maintained its highly successful School Book Prize in 1987-88. A book is presented to the student in each B.C. high school who receives the highest science marks in the graduating year. "British Columbia: Frontier for Ideas" by Harry Cullis and David Suzuki, was this

year's prize. The program is administered for the Science Council by the British Columbia Science Teachers Association.

Support was provided so that two British Columbia high school students could take part in the innovative Shad Valley program. Shad Valley exists to encourage more young people to consider careers in entrepreneurial science and engineering.

Dr. Alan Carter organized a series of lectures by prominent scientists for students in the International Baccalaureate and Advanced Placement Programs. The Science Council covered some of his costs with a grant of $2,400.

Public Awareness

In order to increase awareness of the Science Council, its programs and activities, and to make itself more aware of research and development in the province, the Council held its September meeting in Victoria. It was the first time the Science Council had met outside the Lower Mainland.

The Honourable Stan Hagen, Minister of Advanced Education and Job Training, and members of his staff, as well as officials of the Ministry of Economic Development, joined the Council for a reception and dinner at the Laurel Point Inn. The next day, Council members toured the science and engineering facilities at the University of Victoria and Robotic Systems International's factory at nearby Sidney.

The visit was covered extensively by the Victoria press, radio and television.

Plans for a similar meeting in Prince George in April, 1988 were well-advanced as the fiscal year drew to a close.

A one-hour television show on the Knowledge Network in October, carried the Science Council message to viewers throughout the province. The program featured the 18-minute video show, "Payback: The Rewards of Good Science," which presents some of the commercially successful research that has been supported by Science Council grants and awards. As well, the winners of the 1988 British Columbia Science and Engineering Gold Medals were announced on the program. Chairman Denis Connor answered questions posed by hostess Barbara Constantine and by viewers.

A new general brochure describing the Science Council and its activities was produced in 1987-88 as was one specific to the Scholarships and Fellowships programs.

BC Advanced Systems Institute

At the request of the Ministry, the Science Council undertook to strengthen the links between it and the BC Advanced Systems Institute. The Institute was set up, under the federal-provincial ERDA sub-agreement on science and technology, to encourage excellence in robotics, artificial intelligence, microelectronics and computer science. The Science Council agreed to provide administrative assistance and publicity to the Institute, and to work towards the rationalization of scholarship and other programs.

To bring the two organizations even more closely together, the Past Chairman of the Science Council, Dr. Denis Connor, was appointed Chairman of the BC Advanced Systems Institute's Board of Directors.

New Members and Retiring Members

Seven members of the Science Council retired in 1987-1988. These included Dr. Harold Copp, Dr. John Dewey, Dr. John Dirks, Dr. Don George, Mr. Bryon Hodges, Dr. George May and Dr. Ian Warren. We note, with deep sadness, the death of Dr. Warren, soon after his retirement from the Council.

In February, The Honourable Stan Hagen, Minister of Advanced Education and Job Training, appointed their replacements. New to the Council are Dr. Tom Calvert, Ms. Gail Gabel, Dr. Val George, Dr. Julia Levy, Mr. Jim McFarlane, Dr. Eric Manning and Dr. Kamlesh Patel.

The Secretariat on Science, Research and Development

Science Council members are volunteers. So are the members of the committees that review applications for the various grants, scholarships, fellowships and award nominations. Ongoing administration of these programs is provided by the staff of the Research Secretariat.

With a full time staff of nine, the Secretariat provides services to the Science Council of British Columbia and the British Columbia Health Care Research Foundation. During 1987-88 it also administered the federal-provincial T.E.S.T. (Training for Employment in Science and Technology) employment assistance program under contract to the governments of British Columbia and Canada. It advises on and distributes information to potential applicants, processes applications and monitors the progress of each researcher, student and trainee.

The Secretariat organizes the Council's regular meetings and those of the various standing committees and subcommittees. It maintains close contact and exchanges information with other organizations across the country and throughout the world that have a specific interest in developing scientific and technological resources.

Dr. Jack Sample, Executive Director since 1981, announced that he would be retiring at the end of June, 1988.

1987 winners British Columbia Science and Engineering Gold Medals
(left to right) Derek Barnes, Peter Hochachka, Roy Nodwell,Mark Churchland, Walter Schilling.

Sharmin Gamiet, UBC Soil Science,
GREAT Scholarship Winner.

Dr. Denys LeClerc, Industrial Postdoctoral
Fellow, Paprican, Vancouver

Ken Spencer, Creo Electronics, Burnaby
AGAR Recipient

Participants in the Manufacturing
SPARK Forum, March, 1988.

Science Council of B.C.
Schedule of Assistant Grants for
Applied Research (AGAR) Commitments
for the year ended March 31, 1988

1. Research Grant Competition #16 (RC-16):

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
A. AGRICULTURE & FOOD		
Dr. K. Colbow (SFU, Physics)	Automated apple sorting using passive infrared detector or video image analysis.	50,000
Dr. B.D. Owen (UBC, Animal Science)	Cellulosic pulp mill wastes in beef cattle finishing rations.	43,690
Dr. K.L. Pinder (UBC, Chemical Engineering)	Development of a separated-phase anaerobic fermentation process for industrial wastes from food processing.	29,700
Dr. R. Rajamahendran (UBC, Animal Science)	Evaluation of cow side progesterone enzyme immunoassay as a means of improving reproductive performance in dairy cows.	42,788
B. AQUATIC RESOURCES		
Mr. S.F. Cross (Aquametrix Research Ltd., Sidney)	Refinement and standardization of remote setting procedures for the British Columbia oyster growers industry.	32,500
Mr. J.R. Ellis (ReTech Capital Applied Research and Technology, Victoria)	Salmon farm fish inventory system.	93,475
Dr. R.A. Lansman (Quadra Logic Technologies, Vancouver)	Diagnosis of fish diseases.	51,823
Dr. R. Ring (UVIC, Biology)	Biocontrol of Eurasian water milfoil, ***Myriophyllum spicatum.***	30,144

1. Research Grant Competition #16 (RC-16) *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
Dr. P.R. Waterstrat (Innovative Aquaculture Products Ltd., Lasqueti Island)	Reproductive management of oysters, production of sterile polypoid Pacific Oysters.	50,000
C. COMPUTERS & COMPUTING		
Dr. S.J. Eady (Centre for Speech Technology Research, Victoria)	An automated system for computer-generated speech output.	42,260
Mr. G.M. Josin (Neural Systems Inc., Vancouver)	Applied research and development of a neural systems simulator.	35,000
D. ELECTRONICS & COMMUNICATIONS		
Dr. V. Cuperman (SFU, School of Engineering Science)	Low rate speech coding for mobile radio applications.	49,880
Dr. H.L. Malm (Tiac Manufacturing Inc., Port Moody)	Image processing system, a high speed, low cost image processing system.	87,170
Dr. R. Orth (ALI Corp. Limited Partnership, Burnaby)	Prototype development of a Computer Aided Tomographic (C.A.T.) Breast Imager.	20,000
Mr. D.S. Simkins (Vibrante Technologies, Delta)	Pole analyser.	76,485
E. ENERGY		
Dr. A.E. Steck (BTC Membranes Inc., North Vancouver)	Development of a low-cost solid polymer electrolyte as an alternative to perfluorinated type membranes in fuel cells.	88,200

1. **Research Grant Competition #16 (RC-16)** *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
F. FORESTS & FOREST PRODUCTS		
Dr. J.H. Borden (SFU, Biological Sciences)	Integrated management of bark beetles.	41,023
Mr. J.M. Ewart (F.E.R.I.C., Vancouver)	Length optimizer for a mechanical stroke delimber.	29,300
Dr. L.R. Galloway (UBC, Chemical Eng.)	The removal of plastic contaminants from virgin kraft pulp.	34,140
Mr. J.T. Peterson (F.E.R.I.C., Vancouver)	Roadside processing (limbing and bucking of logs).	46,755
Dr. D.R. Seip (UBC, Faculty of Forestry)	Development of logging recommendations to protect caribou populations in central B.C.	30,020
Dr. J.K. Turnbull (MacMillan Bloedel Research, Vancouver)	Improved control of peroxide brightening of mechanical pulp.	70,536
Dr. J.M. Webster (SFU, Biological Sciences)	Use of recombinant DNA probes to identify the nematode complex affecting the forestry industry.	34,504
G. MANUFACTURING & MACHINERY		
Dr. K. Colbow (SFU, Physics)	Selenium/Tellurium photoreceptors for photocopiers.	49,000
Dr. V. Hyrman (Cheakamus Holdings Ltd., Vancouver)	Application and clinical evaluation of digital technology in the Ultra-Low Energy Electro-Convulsive Therapy Apparatus (ULEECTA).	65,000
H. MINING, MINERALS & METALS		
Dr. W.K. Fletcher (UBC, Geological Sciences)	Gold: Its forms and distribution in soils in the vicinity of gold mineralization.	16,120

1. Research Grant Competition #16 (RC-16) *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
H. MINING, MINERALS & METALS *cont....*		
Dr. C. Godwin (UBC, Geological Sciences)	Application of galena lead isotopes to decisions in mineral exploration and to metallogeny in British Columbia.	32,240
Dr. O. Hungr (Thurber Consultants Ltd., Vancouver) and Dr. P.M. Byrne (UBC, Civil Engineering)	Development of a three-dimensional slope stability (limit equilibrium) program for use in civil and mining engineering applications.	18,725
Mr. S.A. McAlister (Canadian Gold Centrifuge Company Ltd., Clearbrook)	Development of a centrifugal process for concentrating froth flotation tailings at Blackdome Mine.	55,000
	(RC-16) TOTAL $ COMMITTED (1987-88) (29 PROJECTS)	1,345,478

2. Research Grant Competition #17 (RC-17)

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
A. AGRICULTURE & FOOD		
Dr. T.D. Durance (UBC, Food Science)	Separation and recovery of bioactive substances from egg white.	48,700
Dr. L.A. Gilkeson (Applied Bio-Nomics Ltd., Sidney)	Commercial application of the predator, ***Aphidoletes aphidimyza,*** to control aphids in greenhouses and orchards.	32,184
Dr. S. Nakai (UBC, Food Science)	Complete utilization of animal blood wastes for food and pharmaceutical use by a new mild process for separating.	51,195
Dr. J.E. Rahe (SFU, Biological Sciences)	Induced systemic immunity for control of greenhouse cucumber diseases: A preliminary evaluation.	15,659
Dr. J.A. Shelford (UBC, Animal Science)	Computerized dairy feed system.	61,500
B. AQUATIC RESOURCES		
Dr. A. Austin (UVIC, Biology)	Production of aquatic biofilm biomass and protein for use in aquaculture feedstocks.	26,850
Mr. R. Baden and Ms. B. Bunting (Ocean Gold Sea Farms Ltd., Bamfield)	Experimental cultivation of the blue mussel, ***Mytilus edulis,*** using fishing web.	15,328
Dr. R.M. Beames (UBC, Animal Science)	Digestibility measurements in Pacific salmon.	36,190
Drs. H. Burt, K. McErland and D. Kitts (UBC, Pharmaceutical Science & Food Science)	Development of methods for the measurement of antibiotics in salmonids and in medicated feed.	55,000
Mr. S.F. Cross (Aquametrix Research Ltd., Sidney)	Refinement and standardization of remote setting procedures for the British Columbia oyster growers industry.	65,000

2. Research Grant Competition #17 (RC-17) *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
B. AQUATIC RESOURCES *cont....*		
Mr. R.E. Drew (Canadian Fishing Company, Vancouver) and Mr. J.R. Green (Neptune Dynamics Ltd., Vancouver)	Development of a new salmon head cutting technology as a means to improve utilization of the salmon resource through increased canned salmon case yields.	50,000
Dr. W.W. Kay and Dr. T.J. Trust (Microtek Research & Development Ltd., Sidney)	High density vibriosis vaccines for aquaculture.	54,000
Mr. J. Richards (Nanaimo)	Development and evaluation of a practical diet for farmed sablefish from fish silage.	26,680
Mr. D. L. Tillapaugh (Kanish Aquafarms Ltd., Quathiaski Cove)	Crop density and feeding effects on incidence of Bacterial Kidney Disease (BKD) in farm-reared Chinook salmon.	46,700
C. COMPUTERS & COMPUTING		
Mr. W. Baker (Tetrad Computer Applications Ltd., Vancouver)	Development of a low cost microcomputer based presentation system utilizing recently introduced colour graphics hardware.	32,000
Mr. A. Copping (Quilchena Consulting Ltd., Victoria)	The NUTRITION-EXPERT software system to provide comprehensive self-counselling in nutrition for schools, the public and health professionals.	33,100
Dr. J.C. Dill (SFU, School of Engineering Science)	Computer aids in analysis and design of aesthetically pleasing geometric shapes.	45,000
Mr. C. Dewhurst (Capilano Computing Systems Ltd., Vancouver)	Application of parallel processing to logic circuit simulation and minimization.	50,000

2. Research Grant Competition #17 (RC-17) *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
C. COMPUTERS & COMPUTING *cont....*		
Dr. P. Hickson (White Rock)	An optical scanner for the digitization and computer analysis of images with specific application to the fields of medicine and earth sciences.	29,000
Mr. L.R. Lewthwaite (Aztech Systems Inc., Victoria)	"Scribe" report-writer software.	30,000
Mr. G.W. McIntosh (GDT Softworks Inc., Burnaby)	Device drivers.	70,000
Dr. I.R. Morrison (Acquired Intelligence Inc., Victoria)	Interfacing "Nexpert" to an automated knowledge acquisition system.	40,000
Dr. P.J. Voda (Complete Logic Systems Inc., North Vancouver)	"TRILOGY – 2" (a fifth generation system for large applications).	60,000
D. ELECTRONICS & COMMUNICATIONS		
Mr. J. Keightley (Pthalo Systems, Burnaby)	Development of a three laser light source for use in digital film recorders.	70,000
Mr. A. Kinnee (Neil Squire Foundation, North Vancouver)	Ability switches.	18,000
Dr. R. Orth (ALI Corp. Limited Partnership, Burnaby)	Prototype development of a Computer Aided Tomographic (C.A.T.) breast imager.	50,000
Dr. A.H. Rawicz (SFU, School of Engineering Science)	Thermal reliability network analysis system for electronic components, printed circuit boards, hybrids, and integrated circuits.	87,300

2. Research Grant Competition #17 (RC-17) *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
D. ELECTRONICS & COMMUNICATIONS *cont....*		
Mr. R.F. Redden (Crystar Research Inc., Victoria)	Flux crystal growth technology development for potassium titanyl phosphate (KTP), yttrium iron garnate (YIG) and beta barium borate (BBB) crystals.	30,000
Dr. S.P. Stapleton (TRL Microwave Tech. Inc., Burnaby)	Gallium arsenide monolithic microwave integrated circuit receiver system for a direct broadcasting satellite.	93,410
D. ENERGY		
Dr. D.M. Camm (Vortek Industries Ltd., Vancouver)	Calorimeter for ultra-high continuous heat flux.	67,414
Dr. R.L. Evans (UBC, Mechanical Eng.)	Turbulent flame propagation in alternative fuels.	18,560
Mr. R. Little and Mr. K. Leman (Regency Industries Ltd., Delta)	Computer analysis design tool development project for woodstoves.	52,000
F. FORESTS & FOREST PRODUCTS		
Dr. T.M. Ballard (UBC, Soil Science)	Prescribed fire effects on sulfur in soils.	37,300
Dr. J.J. Dukarm (AAL-Autometrics Association Ltd., Victoria)	An intelligent job aid for backlog reforestation.	24,940
Mr. J.M. Ewart (F.E.R.I.C., Vancouver)	Operators restraining harness for a ground skidding vehicle.	54,120
Dr. D.P. Lavender (UBC, Faculty of Forestry)	Improving cold hardiness of yellow cedar, western red cedar and white spruce seedlings.	75,532

2. Research Grant Competition #17 (RC-17) *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
F. FORESTS & FOREST PRODUCTS *cont....*		
Dr. B.S. Lindgren (Phero Tech Inc., Vancouver)	Developing strategies and techniques for use of aggregation inhibiting semiochemicals of bark beetles.	36,980
Dr. J.A. Loo-Dinkins (UBC, Department of Forest Sciences)	Better recognition of genetic value in British Columbia's forest tree progeny tests.	12,500
Dr. K.L. Pinder (UBC, Chemical Engineering)	Chlorine dioxide production by direct sulfur reduction of sodium chlorate.	67,600
Dr. J.V. Thirgood (UBC, Faculty of Forestry)	The establishment of an irrigated poplar plantation for disposal of sewage effluent.	50,000
Dr. W.E. Vidaver (SFU, Biological Sciences)	Physiological quality and performance evaluation of tree nursery planting stock.	25,400
G. MANUFACTURING & MACHINERY		
Mr. E. Jackson (International Submarine Engineering Research, Port Coquitlam)	Adaptive digital hydraulic pressure controller.	40,000
Drs. A.M. Leung, S.R. Morrison and R.F. Frindt (SFU, Physics and Engineering Science)	Development of a low power ethanol sensor.	34,500
Dr. A. Poursartip and Dr. E. Teghtsoonian (UBC, Metals and Materials Engineering)	Optimized processing of composite materials.	60,000
Dr. G.W. Vickers (UVIC, Mechanical Engineering)	Computer-aided lofting, fairing and manufacture in small shipyards.	53,250

2. Research Grant Competition #17 (RC-17) *cont....*

Grant Recipient & Organization	Project Description	Total $ Committed 1987-88
G. MANUFACTURING & MACHINERY *cont....*		
Dr. C. Winter (Quantum Technology Corp., Surrey)	Development of a medium sized helium liquifier.	20,000
H. MINING, MINERALS & METALS		
Dr. G. Richards and Dr. J.K. Brimacombe (UBC, Centre for Metallurgical Process Engineering)	An industrial investigation of improvements in slag reduction processes.	18,600
	(RC-17) TOTAL $ COMMITTED (1987-88) (47 PROJECTS)	2,071,492

Industrial Post Doctoral Fellowships Awarded 1987 – 1988

1. NEW AWARDS

Award Recipient	Discipline & Year of Graduation	Employing Company	$ Awarded
Dr. J. Chang	Entomology, 1986	Phero Tech Inc., Vancouver	25,000
Dr. N.E. Down	Fish Physiology, 1984	Quadra Logic Technologies Inc., Vancouver	25,000
Dr. S. Fitzpatrick	Entomology, 1988	Integrated Crop Management Services, Okanagan Centre	25,000
Dr. D. Leclerc	Analytical Chemistry, 1985	PAPRICAN, Vancouver	25,000
Dr. L. Sojo	Analytical Chemistry, 1988	CBR International, Sidney	25,000
Dr. S. Wessel	Physics, 1985	Newtec Research Corp., Burnaby	25,000
		Subtotal (6 awards)	150,000

2. RENEWAL AWARDS

Dr. B. Sharpe	Mathematics, 1984	MacDonald Dettwiler & Associates Ltd., Richmond	25,000
Dr. U. von Sacken	Physics, 1985	Moli Energy Ltd., Burnaby	25,000
Dr. J.B. Wallace	Chemical/Biochemical Engineering, 1987	B.C. Research, Vancouver	25,000
		Subtotal (3 awards)	75,000
		TOTAL (9 awards)	**225,000**

Science and Technology Awards for Returning Students 1987 – 1988

Name of Student	Name of Supervisor, Department, University	Degree sought and expected year of completion	Cooperating Organization	$ Awarded
M. Borugian	Dr. J. Levy, Microbiology, UBC	Ph.D., 1992	Quadra Logic Technologies Inc., Vancouver	25,000
A. Sy	Dr. R. Campanella, Civil Engineering, UBC	Ph.D., 1991	Klohn Leonoff Ltd., Richmond	25,000
			TOTAL (2 awards)	50,000

THE SCIENCE COUNCIL OF
BRITISH COLUMBIA AND
SECRETARIAT ON SCIENCE,
RESEARCH AND DEVELOPMENT

FINANCIAL STATEMENTS

FOR THE YEAR ENDED

MARCH 31, 1988

AUDITORS' REPORT

TO THE MINISTER OF

ADVANCED EDUCATION AND JOB TRAINING

We have examined the balance sheet of The Science Council of British Columbia and Secretariat on Science, Research and Development as at March 31, 1988 and the statements of research receipts, expenditures and appropriations; T.E.S.T. receipts, expenditures and appropriations; and operations receipts, expenditures and appropriations for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Council and Secretariat as at March 31, 1988 and the results of their operations for the year then ended in accordance with generally accepted accounting principles, as modified by note 1 to the financial statements, applied on a basis consistent with that of the preceding year.

Coopers & Lybrand

Vancouver, B.C.

May 10, 1988

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
BALANCE SHEET AS AT MARCH 31, 1988

	1988 $	1987 $
ASSETS		
CASH AND SHORT-TERM DEPOSITS	3,007,343	2,985,688
ACCOUNTS RECEIVABLE	262,784	33,435
PREPAID EXPENSES	2,217	1,611
	3,272,344	3,020,734
LIABILITIES		
ACCOUNTS PAYABLE AND ACCRUED LIABILITIES	111,304	96,018
APPROPRIATIONS		
RESEARCH (note 2)	2,941,025	2,603,061
TRAINING EMPLOYMENT IN SCIENCE AND TECHNOLOGY (T.E.S.T.) (note 3)	180,980	252,083
OPERATIONS	39,035	69,572
	3,161,040	2,924,716
	3,272,344	3,020,734

COMMITMENTS (Schedule and notes 2 and 3)

APPROVED BY THE COUNCIL AND SECRETARIAT

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
STATEMENT OF RESEARCH RECEIPTS, EXPENDITURES AND APPROPRIATIONS
FOR THE YEAR ENDED MARCH 31, 1988

	1988 $	1987 $
RESEARCH RECEIPTS		
Grants from the Province of British Columbia	3,500,000	3,500,000
Interest	250,161	225,010
Refunds of prior years' research expenditures	107,068	82,036
Strategic Planning for Applied Research and Knowledge (S.P.A.R.K.) recoveries	100,000	
Contributions — Supercomputer Study	13,500	
Other	230	454
	3,970,959	3,807,500
RESEARCH EXPENDITURES – see Schedule		
Research grants	3,015,528	2,838,723
Industrial Post-Doctoral Fellowships (IPDF)	192,720	228,125
Graduate Research Engineering and Technology (GREAT) awards		507,000
Science and Engineering awards	23,973	19,799
Special requests	127,956	90,215
Special projects	89,366	86,447
Honoraria and other expenses	11,159	8,950
Strategic Planning for Applied Research and Knowledge (S.P.A.R.K.)	172,293	
	3,632,995	3,779,259
EXCESS OF RECEIPTS OVER EXPENDITURES	337,964	28,241
RESEARCH APPROPRIATIONS — BEGINNING OF YEAR	2,603,061	2,574,820
RESEARCH APPROPRIATIONS — END OF YEAR (encumbered by outstanding commitments) (note 2)	2,941,025	2,603,061

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
STATEMENT OF T.E.S.T. RECEIPTS, EXPENDITURES AND APPROPRIATIONS
FOR THE YEAR ENDED MARCH 31, 1988 (note 3)

	Year ended March 31, 1988	Period from December 1, 1986 to March 31, 1987
T.E.S.T. RECEIPTS		
Grants from the Province of British Columbia	382,171	250,000
Grants from the Government of Canada	60,071	15,052
Interest income	23,031	2,083
	465,273	267,135
T.E.S.T. EXPENDITURES (GRANTS)	481,749	
T.E.S.T. EXPENDITURES (OPERATIONS)		
Administration and accounting	8,587	6,496
Courier, communications and travel	1,241	495
Rent	5,856	813
Salaries and employee benefits	38,071	4,855
Utilities and supplies	872	2,393
	536,376	15,052
(DEFICIENCY) EXCESS OF RECEIPTS OVER EXPENDITURES	(71,103)	252,083
T.E.S.T. APPROPRIATIONS — BEGINNING OF PERIOD	252,083	
T.E.S.T. APPROPRIATIONS — END OF PERIOD (encumbered by outstanding commitments) (note 3)	180,980	252,083

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
STATEMENT OF OPERATIONS RECEIPTS, EXPENDITURES AND APPROPRIATIONS
FOR THE YEAR ENDED MARCH 31, 1988

	1988 $	1987 $
OPERATIONS RECEIPTS		
Grants from the Province of British Columbia	300,000	300,000
Interest	12,906	12,163
Recoveries —		
Advanced Systems Foundation	4,071	
British Columbia Health Care Research Foundation	120,629	112,843
Other		134
Training Employment in Science and Technology	54,627	15,052
	492,233	440,192
EXPENDITURES		
Computer services	2,707	5,748
Consulting and temporary staff	3,865	4,466
Furniture and equipment	4,108	11,430
Leasehold improvements	467	49,538
Long-term planning study		40,000
Meetings	9,214	4,593
Personnel – recruitment	36,158	
Photocopying and printing	31,944	20,050
Postage and courier	18,937	7,722
Professional fees	5,669	5,580
Publications	2,362	2,434
Rent	54,660	38,240
Salaries and employee benefits	317,465	267,396
Stationery and supplies	3,773	4,597
Telephone	16,287	11,523
Travel	15,154	9,914
	522,770	483,231
DEFICIENCY OF RECEIPTS OVER EXPENDITURES	(30,537)	(43,039)
OPERATIONS APPROPRIATIONS — BEGINNING OF YEAR	69,572	112,611
OPERATIONS APPROPRIATIONS — END OF YEAR	39,035	69,572

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
NOTES TO FINANCIAL STATEMENTS
FOR THE YEAR ENDED MARCH 31, 1988

1. ACCOUNTING POLICIES

Fixed Assets

Fixed assets are not capitalized and depreciated as assets of the Council and Secretariat, but are written off in the period in which they are purchased.

Research Grants

Outstanding research grant commitments are conditional on receipt of satisfactory progress reports and are not recorded until actually disbursed.

2. RESEARCH GRANT COMMITMENTS (see Schedule)

During the year, the Council approved funding for research projects, IPDF's, GREAT's, Science and Engineering awards, special requests, special projects, honoraria and other expenses totalling $4,184,017. At March 31, 1988, known outstanding commitments totalled $2,830,549 which, together with additional estimated renewed commitments for the year ending March 31, 1989 of $1,696,850, amount to $4,527,399 in known and estimated outstanding commitments.

3. TRAINING EMPLOYMENT IN SCIENCE AND TECHNOLOGY

This program is a joint federally and provincially funded incentive program whereby financial assistance is available to firms and corporations that hire post-secondary graduates in the fields of science, engineering and technology. It is administered by the Secretariat under contract to the B.C. Ministry of Advanced Education and Job Training, and Employment and Immigration Canada. Administration costs for the program are paid by the Secretariat and are later reimbursed by the federal government. Except for $129,968 still receivable, funding from the provincial government for the programs has been received. The federal government funds administration costs but disburses funds directly to the grantees. At March 31, 1988, known commitments totalled $180,980 for provincial grants. The program was funded until March 31, 1988. A review by the two governments is underway and will determine if funding will continue.

4. COMPARATIVE FIGURES

In the year ended March 31, 1988, minor changes have been made in financial statement description and in the classification of certain amounts. These changes are a matter of presentation only and do not represent a change in accounting policy. The financial statements for the year ended March 31, 1987, included for comparative purposes, have been reclassified to conform with the current year's format.

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
SCHEDULE OF COMMITMENTS AND DISBURSEMENTS OF SCIENCE COUNCIL RESEARCH GRANTS
FOR THE YEAR ENDED MARCH 31, 1988

	Known outstanding commitments – beginning of year $	Additional commitments during year $	Commitment reductions during year $	Disbursed during year $	Known outstanding commitments – end of year $	Estimated renewed commitments 1988 – 1989 $	Known and estimated outstanding commitments at March 31, 1988 $
RESEARCH GRANTS							
Research Competition #6	7,970				7,970		7,970
Research Competition #7	9,340		(9,340)				
Research Competition #9	27,990		(19,277)	3,248	5,465		5,465
Research Competition #10	982				982		982
Research Competition #11	33,740		(27,530)	6,210			
Research Competition #12	205,788		(75,881)	96,527	33,380		33,380
Research Competition #13	361,019		(30,124)	208,287	122,608		122,608
Research Competition #14	641,166		(88)	549,635	91,443		91,443
Research Competition #15	1,006,242	5,349	(13,279)	830,085	168,227		168,227
Research Competition #16		1,345,478	(12,152)	716,253	617,073	619,298	1,236,371
Research Competition #17		2,071,492		605,283	1,466,209	811,552	2,277,761
	2,294,237	3,422,319	(187,671)	3,015,528	2,513,357	1,430,850	3,944,207
IPDF's	142,720	225,000	(43,750)	192,720	131,250		131,250
GREAT's						266,000	266,000
STAR's		50,000			50,000		50,000
SCIENCE AND ENGINEERING AWARDS		23,973		23,973			
SPECIAL REQUESTS							
Arts, Science and Technology Centre – Director	45,000			15,000	30,000		30,000
Arts, Science and Technology Centre – Regional Science Fairs 1987	2,100			2,100			2,100
Arts, Science and Technology Centre – Regional Science Fairs 1988		21,000		18,900	2,100		2,100
B.C. Research — Artificial Light	3,735		(3,735)				
B.C.S.T.A./F.I.S.A. Book Prize 1987	5,230		(3,339)	1,891			
B.C.S.T.A./F.I.S.A. Book Prize 1988		10,000		4,005	5,995		5,995
S.T.C. Enterprises–Forest Technology Study	5,150		(5,150)				
Supercomputer Study	10,000	13,500		23,500			
Superconductivity Research	5,000	45,000		45,000	5,000		5,000
T.V. Science Show '87 (Pearl Productions)	10,000			9,000	1,000		1,000
Science talks		2,400		2,160	240		240
CCCT — Shad Valley 1988		6,400		6,400			
	86,215	98,300	(12,224)	127,956	44,335		44,335
SPECIAL PROJECTS							
A.G.A.R. Program Review Project		20,000		16,100	3,900		3,900
Public Information		73,266		73,266			
		93,266		89,366	3,900		3,900
STRATEGIC PLANNING FOR APPLIED RESEARCH AND KNOWLEDGE (S.P.A.R.K.)		260,000		172,293	87,707		87,707
HONORARIA AND OTHER EXPENSES		11,159		11,159			
	2,523,172	4,184,017	(243,645)	3,632,995	2,630,549	1,696,850	4,527,399